CLAIMS

What is claimed is:

1. A process of making a tubular member comprising:

a. forming a first sub-blank having a thickness and a second sub-blank having different thickness;

b. joining the first and second sub-blanks together along a joint line to create a flat blank having a step at the joint between first and second sub-blanks and opposing side edges;

c. locating the flat blank between two press forming die halves so that the step faces outwardly toward the die halves; and

d. pressing the two die halves together to form the flat blank into a substantially tubular member, thereby reducing the step at the joint.

2. A process of making a tubular member according to Claim 1, wherein the substantially tubular member has a cross-section that varies along an axial length of the tubular member.

3. A process of making a tubular member according to Claim 1, wherein the joint line has an axial directional component.

4. A process of making a tubular member according to Claim 1, wherein the joint line has a radial directional component.

5. A process of making a tubular member according to Claim 2, wherein the joint line his both an axial directional component and a radial directional component.

6. A process of making a tubular member comprising:

a. forming a first sub-blank and a second sub-blank;

b. joining the first and second sub-blanks together along a joint line having an axial directional component to create a flat blank having opposing side edges; and

c. joining the opposing side edges of the flat blank together to form a tubular member.

7. A process of making a tubular member according to Claim 6, wherein the tubular member has a cross-section that varies along an axial length of the tubular member.

8. A process of making a tubular member according to Claim 6, wherein the first and second sub-blanks differ from one another in one of thickness or material.

9. A process of making a tubular member according to Claim 6, wherein the joint line further has a radial directional component.

10. A process of making a tubular member according to Claim 6, further comprising press forming the flat blank between two female die halves.

11. A process of making a tubular member comprising:

a. creating a flat blank comprising a first portion adjoining a second portion along a boundary line, wherein at least one of a material and a thickness of the first portion is different from that of the second portion, and wherein the boundary line has both an axial directional component and a radial directional component; and

b. forming the blank into a tubular member by joining the opposing side edges of the blank together.

12. A process of making a tubular member according to Claim 11, wherein forming the blank into a tubular member further comprises forming the flat blank into a substantially U-shaped member, and press forming the substantially U-shaped member into a substantially tubular member.

13. A process of making a tubular member according to Claim 12, wherein the substantially tubular member has a cross-section that varies along an axial length of the substantially tubular member.

14. A process of making a tubular member according to Claim 11, wherein the boundary line has an arcuate shape.

15. A process of making a tubular member according to Claim 11, wherein the material of the first portion is different from that of the second portion, and the material is made different by applying a coating or treating operation to the first portion of the flat blank.

16. A process of making a tubular member comprising:

a. creating a flat blank having a tendency to spring back that varies along the axial length of the flat blank;

b. applying a central axial force to the blank to create a substantially U-shaped structure with two substantially parallel arms, each of the arms having a distal edge; and

c. applying a force to move the distal edges of the arms together by a distance, wherein the distance varies along the axial length of the substantially U-shaped member.

17. A process of making a tubular member according to Claim 16, further comprising press forming the substantially U-shaped member into a substantially tubular member.

18. A process of making a tubular member according to Claim 17, wherein the substantially tubular member has a cross-section that varies along an axial length of the substantially tubular member.

19. A process of making a tubular member according to Claim 16, wherein creating the flat blank further comprises joining a sub-blank having a thickness to another sub-blank having a different thickness to provide a flat blank with a thickness that varies along its axial length.

20. A process of making a tubular member according to Claim 16 wherein creating the flat blank includes causing a portion of the flat blank to be made of a material and another portion of the flat blank to be made of a different material.

21. A process of making a tubular member comprising:

a. forming a substantially tubular member having an initial cross-sectional shape;

b. locating the substantially tubular member in a press forming die between two female die halves which together define a mold cavity with a cross-sectional shape that is different from the initial cross-sectional shape and that is not substantially circular; and

c. moving the two female die halves together to cause the tubular member to take on the cross-sectional shape of the mold cavity.

22. A process of making a tubular member according to Claim 21, wherein the forming a substantially tubular member further comprises forming a flat blank into a substantially U-shaped member and press forming the substantially U-shaped member into the substantially tubular member.

23. A process of making a tubular member according to Claim 21, wherein the different cross-sectional shape is defined by more than two radii, each having a different dimension.

24. A process of making a tubular member according to Claim 21, wherein the different cross-sectional shape is defined by at least three radii separated from each other.

25. A process of making a tubular member according to Claim 24, wherein at least two of the at least three radii have substantially identical dimensions.

26. A process of making a tubular member according to Claim 24, wherein a portion of the cross-sectional shape that is defined by each of the three radii, respectively, is separated from each other by another radiused portion of the cross-sectional shape, or by a substantially straight portion of the cross-sectional shape, or by both another radiused portion and a substantially straight portion.

27. A process of making a tubular member comprising:

a. forming a substantially U-shaped member;

b. locating the substantially U-shaped member in a press forming die between two female die halves which together define a mold cavity with a cross-sectional shape that is not substantially circular; and

c. moving the two female die halves together to cause the tubular member to take on the cross-sectional shape of the mold cavity.

28. A process of making a tubular member according to Claim 27, wherein the cross-sectional shape is defined by more than two radii, each having a different dimension.

29. A process of making a tubular member according to Claim 27, wherein the cross-sectional shape is defined by at least three radii separated from each other.

30. A process of making a tubular member according to Claim 29, wherein at least two of the at least three radii have substantially identical dimensions.

31. A process of making a tubular member according to Claim 29, wherein a portion of the cross-sectional shape that is defined by each of the three radii, respectively, is separated from each other by another radiused portion of the cross-section, or by a substantially straight portion of the cross-section, or by both another radiused portion and a substantially straight portion.

32. A process of making a tubular member comprising:

a. forming a first sub-blank and a second sub-blank;

b. joining the first and second sub-blanks together along an arcuate joint line to create a flat blank having opposing side edges; and

c. joining the opposing side edges of the flat blank together to form a tubular member.

33. A process of making a tubular member according to Claim 32, wherein the tubular member has a cross-section that varies along an axial length of the tubular member.

34. A process of making a tubular member according to Claim 32, wherein the first and second sub-blanks differ from one another in one of thickness or material.

35. A process of making a tubular member according to Claim 32, further comprising press forming the flat blank between two female die halves.

36. A process of making a tubular member according to Claim 32, wherein joining the first and second sub-blanks together comprises a welding operation.

37. A process of making a tubular member comprising:

a. forming a first sub-blank from a flat sheet of a material;

b. forming a second sub-blank from a flat sheet of a different material;

c. joining the first and second sub-blanks together along a joint line to create a flat blank having opposing side edges;

d. press forming the flat blank into a substantially U-shaped member;

e. press forming the substantially U-shaped member into a substantially tubular member; and

f. joining the opposing side edges of the substantially tubular member together to form a tubular member.

38. A process of making a tubular member according to Claim 37, wherein the tubular member has a cross-section that varies along an axial length of the tubular member.

39. A process of making a tubular member according to Claim 37, wherein joining the first and second sub-blanks together comprises a welding operation.

40. A process of making a tubular member according to Claim 39, wherein joining the opposing side edges comprises a welding operation.